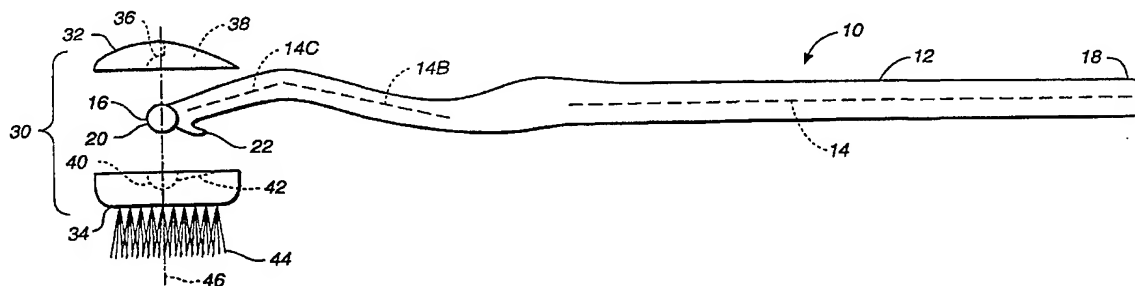




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(54) Title: TOOTHBRUSH



## (57) Abstract

A toothbrush (10) provides a bi-angled handle (12) member generally defining a primary longitudinal axis (14), a brush head member (30) pivotable about the handle member (12) on a brush head axis, and carrying downwardly-depending brush bristles (44) defining a bristle axis (46), such that the brush head axis is generally perpendicular to both the handle member (12) longitudinal axis (14) and the bristle axis (46). The handle member (12) terminates in a first end enabling brush head (30) rotational movement only about the brush head axis.

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TOOTHBRUSH  
DESCRIPTION

TECHNICAL FIELD

5           This invention relates generally to dental hygiene techniques and apparatus, and more specifically to an improved toothbrush mechanism to efficiently accommodate cleaning sites in the mouth.

BACKGROUND ART

10           Toothbrushes have been designed to clean teeth by removing plaque and food debris with brush bristles of various dimensions, firmness, materials, and retention methods. Originally, and dating back several centuries, the toothbrush had a design of brush bristles mounted on a handle which carried the bristles into the mouth. The  
15           fixed nature of the brush handle required that the user manipulate the brush into exact position before activating the brushing motion. Variations of brush design from uneven bristle heights to "serrated" designed bristle patterns attempted to enable bristles to extend between  
20           the teeth for greater cleansibility. However, the brush handle and head were always rigidly fixed in one position.

          Some toothbrush designs have provided rotational brush heads rotating on an axis parallel to the axis described by the brush head bristles and perpendicular to  
25           the targeted tooth surfaces. However, they have no rotation to accommodate the curvature of the dental arch.

          Other toothbrush designs attempted to create better hygiene access through changing the angulation between the brush head and the brush handle. These  
30           designs had a number of proposed angulations between the head and handle, but the head and handle were fixed in place relative to each other regardless of the angulation.

          The design of toothbrushes with an angled head had either single or double (bi-angled) bends in the  
35           connector. The head was angled toward the targeted teeth. The intention of the bend was to allow the brush to function around the corners of teeth and on the inside (tongue side) surfaces of teeth that either could not be reached by conventional straight brushes or would be

highly demanding of the operator to adjust the straight brush to reach these surfaces. Despite this improvement over straight designs, the rigid fixture of the head to the handle could not adapt to various angles of access and presented an abnormal relationship of brush head to teeth when a straight brush design might serve best.

Some of these angled designs also suffered from design imbalance. A balanced toothbrush is designed so that the brush head meets a line that extends from the longitudinal axis of the handle. The farther the brush head is from this axis line, the more out of balance the brush is. The greater the brush imbalance, the greater amount of force must be applied to the handle to activate the bristles on the brush head.

One variation included a flexible connector between the brush head and brush handle with a spring-like connector designed to absorb excess forces applied to the brush to prevent tooth abrasion, but it yielded control while relieving stress. In addition, there was little or no true rotation of the brush head itself to offer improved access for improved hygiene.

All known toothbrushes have bristles covering the entire brushing surfaces, and the common use of toothpaste requires the operator to either precariously place toothpaste on the surface of the bristles or force the toothpaste in between the bristles. These techniques of toothpaste placement risk toothpaste being dislodged from the bristles or becoming imbedded in between the bristles and not being effective or evenly used during the brushing period.

#### DISCLOSURE OF INVENTION

The improved toothbrush of this invention provides a modified toothbrush structure to efficiently accommodate cleaning sites in the mouth. The inventive toothbrush comprises a bi-angled handle member generally defining a primary longitudinal axis, a brush head member pivotable about the handle member on a brush head axis of rotation, and carrying a plurality of downwardly-depending

brush bristles together defining a plurality of parallel longitudinal bristle axis, such that the brush head axis of rotation is generally perpendicular to both the handle member primary longitudinal axis and the bristle axis. In  
5 one embodiment, the handle member terminates in a first end bearing a pivot element enabling brush head rotational movement only about the brush head axis. The brush head member preferably consists of a top portion and bottom portion each bearing a pivot element contact surface and a  
10 handle member guide slot to enable relative motion of the brush head only about the brush head axis, with the brush head bottom portion carrying the downwardly-depending brush bristles.

An alternate one-piece embodiment of this  
15 invention achieves the same rotating motion by utilizing a flexible joint permanently attached to the lower portion of the brush head. The handle of the brush is thus permanently attached in position to the lower portion of the brush head by a broad flexible joint. The top portion  
20 of the brush head is itself attached to the lower portion of the brush head by a narrow, flexible hinge at the tip of the brush head.

The alternate one-piece embodiment of the inventive brush is assembled by folding the top portion of  
25 the brush head over the joint area where the brush handle joins the lower portion of the brush head, and sealing it to the lower portion of the brush head. A single slot in the top portion of the brush head will allow for limited freedom of movement in the rotating action of the brush  
30 head. Finish and polish of the brush head may be used to remove the hinge at the tip of the brush head which is no longer needed since the top is now sealed to the bottom of the brush head. The finished appearance is nearly  
35 identical to the first embodiment described above, and it shares the same structural benefits (degree of rotation, position of the rotational axis, balance of the instrument along the center axis of the handle, etc.).

The two portions of the brush head may be permanently sealed together during fabrication by heat,

polymerizing cement, adhesive, mechanical fixation, or other bonding mechanism. An alternative, however, is a snap-together mechanism which can be unsnapped and opened for cleaning. A fingernail hold or "lip" can be built  
5 into the "heel" of the brush head on each of the two distally extending portions of the top part of the brush head.

The advantages of this design include:

The permanent attachment of the head to the  
10 handle which effectively eliminates any possibility of inadvertent separation.

Simplified fabrication by enabling the use of a single mold rather than multiple molds.

The flexible joint between the head and the  
15 handle saves space and could allow for longer toothbrush bristles without increasing the width of the brush (the dimension extending from the tips of the bristles to the back of the brush head).

Other variations of this modification may  
20 include:

The hinge which connects the top and bottom portions of the brush head may be recessed into the brush head so it does not protrude from the tip of the brush head. The smoothness of the brush head reduces  
25 possibilities of tissue irritation and contributes to the aesthetic contours of the brush head.

For permanently sealed versions, the hinge may be trimmed off after the top and bottom parts of the brush head have been bonded together. This is done during  
30 the process of finishing the surfaces of the brush. The objective of this variation is to utilize the benefits of the hinge during production while eliminating it in the final brush since is non-functional in a permanently bonded brush head.

35 The inventive toothbrush provides a pivotable brush head where the axis of the rotation of the brush head is perpendicular to both the longitudinal axis of the handle and to the brush bristles. This rotational axis is roughly parallel to long axis of the teeth targeted for

cleaning and can align itself to match the surfaces of the teeth as it follows the arch or curvature of the dentition.

5           The inventive brush is strong yet narrow in dimension to be relatively equivalent to the width of other toothbrushes. The secured, fixed attachment of the head of the brush to the handle precludes the risk of inadvertent release of the brush head.

10           The inventive brush was designed around the principles of oral hygiene and safety. There are only two moving parts that move relative to one another, and the juncture of these parts is enclosed and protected. The bulk of the connector from the handle is preserved providing strength, and the connection of parts which  
15           encases the connector from the handle are permanently bonded. The exterior design of the brush head not only protects the connector joint in plastic, but protects the user from irritation from moving parts through the smooth shape of surrounding plastic. Surfaces between moving  
20           parts are kept as flush as possible and in positions that would be least likely to engage tissue. The design blends its utility with the simple and attractive appearance of the brush head.

25           The design of the brush is sensitive to the broad range of abuse that toothbrushes commonly receive. It can be used by unskilled people with little risk of breakage or damage. The nearly full coverage of the connector on the brush adds security to linkage of the brush head to the handle and limited rotation reduces  
30           stress on the connector.

35           The handle of the inventive brush has two obtuse angles (described as bi-angled) which allows the brush to reach around obstacles such as front teeth and be able to reach back teeth including the distal (back surface area) of posterior teeth. This bi-angled design also allows for freedom of rotation of the brush head without interference from the handle.

          The connector from the brush handle of the brush attaches to the brush head within a confined and protected

space without consuming the entire width of the brush head. This allows for adapting many different sizes and shapes of brush heads while maintaining the protective strength of the connector.

5           The position of the rotation on the brush head is near the midline of the brush but slightly anterior to the midline of the brush head. This will assure adequate cleaning pressure at the tip of the brush and assures the tip of the brush will follow the contours of the teeth far  
10 into back parts of the mouth.

          The inventive brush could accommodate a variety of brush head profiles. One preferred brush head design is triangular with a compact size and rounded edges to permit access with safety to reach confined areas within  
15 the mouth.

          No special connecting pins, coiled springs, or metal is required in the brush to connect the head to the handle. This characteristic simplifies production and reduces costs of fabrication.

20           The inventive brush may include a strong, protected, yet flexible small plastic tongue extending from the handle from the brush handle to the brush head inside the connector assembly. The spring-like projection of plastic helps maintain a static position of the brush  
25 head until the head is activated as it is pressed against the teeth. This plastic spring then acts as a "shock-absorber" to let the brush follow the contours of the teeth with less rocking or instability. In its static position, the spring stabilizes the brush as materials  
30 such as toothpaste are applied to the brush head.

          The small plastic extension of the handle which serves as a spring device to maintain a stable position of the brush head can be varied to a firm state to resist rotation or to a loose state allowing more free rotation  
35 of the toothbrush head. Likewise, the spring device may be deleted altogether for totally free rotation of the brush head. The looseness of the brush head has some advantage since it can freely move against the teeth and conform better to tooth surfaces.



The inventive brush maintains a quality of "balance" not explicit in prior art toothbrushes. Balance is defined as the longitudinal axis from the handle intersecting the point of rotation of the brush head. The benefit is that the shorter the radius between the point of brush head rotation and this axis will minimize the amount of applied stress needed to activate the brush and increase the comfort for the user since any torquing or twisting effect of having the rotation point off this line will be minimized. The longer the radius, the more twisting action of the brush handle will be necessary to activate it or control it.

The inventive brush defines a limit to maximum rotation of 25-35 degrees. In a similar vein, the starting point of rotation is fixed when the flat surface of the brush head (perpendicular to the bristles) is parallel to the flat dominate portion of the brush handle. The rotation occurs as an action of the tip of the brush descending as the heel of the brush head rotates up toward the brush handle. This limitation of rotation is intended to increase the control of the user while allowing for sufficient rotation action to adjust to variations of tooth surfaces. The range of rotation is designed to be aesthetic and not too radical to increase its acceptance by current users of conventional brushes. The limitation of rotation also restricts the range of action of the connector and preserves its structural integrity.

The freely rotating brush head rotates with each stroke and the toe and heel of the brush head has a tendency to "dive" in between teeth, which accentuates its cleaning activity. Equally significant, this action clearly discourages a broad "scrubbing" technique by users which is known to be a primary cause of toothbrush abrasion and associated maladies including gingival (gum) recession, tooth abrasion and formation of grooves on teeth, root sensitivity, etc.

An optional feature might include additional thickness of plastic on the lower part of the brush head to accommodate placement of bristles adjacent to the

depression in the brush head into which the ball of the handle fits.

#### BRIEF DESCRIPTION OF THE DRAWINGS

5                    Fig. 1 is an exploded side elevation view of a first embodiment of an improved toothbrush of this invention illustrating the component parts including a bi-angled handle member generally defining a longitudinal axis and having a first end and a second end, the first  
10                    end bearing a pivot element enabling brush head rotational movement about a brush head axis (normal to the plane of the drawing figure and not visible in this view), and an integral spring element; and a brush head member having a top portion and a bottom portion, the top portion bearing  
15                    a pivot element contact surface and a handle member guide slot, and the bottom portion bearing a pivot element contact surface, guide slot, and a plurality of downwardly-depending brush bristles generally defining a bristle axis;

20                    Fig. 2 is a side elevational view of the first embodiment of the improved toothbrush of this invention as assembled;

                    Fig. 3 is a top plan view of the first embodiment of the improved toothbrush of this invention  
25                    illustrating the position of the handle member first end within the brush head member top portion guide slot;

                    Fig. 4 is a top plan view of the brush head member top portion illustrating the guide slot;

30                    Fig. 5 is a top plan view of the brush head member bottom portion illustrating the pivot element contact surface and guide slot;

                    Fig. 6 is a side elevation view of an alternate embodiment of a bi-angled handle member without an integral spring element;

35                    Fig. 7 is a side elevation view of an alternate embodiment of a brush head member bottom portion bearing a reinforcement feature to accommodate placement of bristles adjacent the depression in the bottom portion (i.e., pivot element contact surface);

Fig. 8 is a side elevation view of an alternate one-piece embodiment of the improved toothbrush of this invention illustrating the component parts including a bi-angled handle generally defining a longitudinal axis and having a first end and a second end; a brush head having a top portion and a bottom portion, the top portion connected to the bottom portion by a flexible hinge and bearing a handle guide slot (not visible in this view), and the bottom portion bearing a plurality of downwardly-depending brush bristles generally defining a bristle axis; and a flexible joint connecting the handle first end and brush head bottom portion, the flexible joint enabling brush head rotational movement about a brush head axis (normal to the plane of the drawing figure and not visible in this view);

Fig. 9A is a side elevational view of the alternate one-piece embodiment of the improved toothbrush of this invention as assembled and illustrating the brush head rotated about the brush head axis to maximum inward rotation;

Fig. 9B is a side elevational view of the alternate one-piece embodiment of the improved toothbrush of this invention as assembled and illustrating the brush head rotated about the brush head axis to maximum outward rotation;

Fig. 10 is a top plan view of the alternate one-piece embodiment of the improved toothbrush of this invention in its open configuration and illustrating the relationship of the handle first end to the brush head top portion guide slot before closure;

Fig. 11 is a top plan view of the alternate one-piece embodiment of the improved toothbrush of this invention in its closed configuration and illustrating the relationship of the handle first end to the brush head top portion guide slot after closure; and

Fig. 12 is a side elevation view of an alternate embodiment of the brush head top and bottom portions bearing a mechanical fastening feature.

## BEST MODE FOR CARRYING OUT THE INVENTION

Fig. 1 is an exploded side elevation view of a first embodiment of an improved toothbrush 10 of this invention illustrating the component parts including a bi-angled handle 12 member generally defining a primary longitudinal axis 14, secondary longitudinal axis 14a, and tertiary longitudinal axis 14b, and having a first end 16 and a second end 18, the first end bearing a pivot element 20 enabling brush head rotational movement about a brush head axis of rotation (normal to the plane of the drawing figure and not visible in this view), and an integral spring element 22 to bias the brush head to a normal position. The brush head member 30 has a top portion 32 and a bottom portion 34, the top portion bearing a pivot element contact surface 36 and a handle member guide slot 38, and the bottom portion bearing a pivot element contact surface 40, guide slot 42, and a plurality of downwardly-depending brush bristles generally defining a bristle axis 46. This view illustrates that the entire toothbrush may consist of only three parts, thereby reducing manufacturing costs.

Fig. 2 is a side elevational view of the first embodiment of the improved toothbrush 10 of this invention as assembled. This view illustrates the general alignment of the brush head pivot axis 48 with the primary longitudinal axis 14 of the handle.

Fig. 3 is a top plan view of the first embodiment of the improved toothbrush 10 of this invention illustrating the position of the handle member first end 16 within the brush head member top portion guide slot 38. This guide slot permits tangential movement of the brush handle first end about brush head axis of rotation 48, but eliminates any other relative movement.

Fig. 4 is a top plan view of the brush head member top portion 32 illustrating the guide slot 38. This view illustrates the relatively simple shape of the brush head member. This shape can of course be modified to accommodate specific dental applications.

Fig. 5 is a top plan view of the brush head

member bottom portion 34 illustrating the pivot element contact surface 40 and guide slot 42. The contact surface 40 (and the respective contact surface 36 on the brush head top portion 32) provides a socket-type capture of the "ball" or pivot element 20 of the brush handle first end. Other pivotable arrangements could be utilized, such as a cylindrical axle, removable pin, or the like.

Fig. 6 is a side elevation view of an alternate embodiment of a bi-angled handle member 50 without an integral spring element. This design is simpler, and may even be preferable in certain applications, as described supra.

Fig. 7 is a side elevation view of an alternate embodiment of a brush head member bottom portion 60 bearing a reinforcement feature 62 to accommodate placement of bristles adjacent the depression in the bottom portion (i.e., pivot element contact surface 64). This reinforcement feature enables secure fastening of a full array of downwardly-depending bristles, which may be desirable.

Several advantages of this embodiment of the inventive apparatus over the prior art include:

- a. A rotational head.
- b. A rotational axis which is perpendicular to the brush handle axis. This maximizes control while allowing the brush head to fit the surface against which it rests while the operator can still move and adjust the brush head position by rotating the brush or bodily movement of the brush handle.
- c. While allowing rotation to accommodate brush head position, there are built-in limits to rotation which prevent a brush head position which would be impractical or ineffective.
- d. The position of the socket on the brush head which accepts the rotator ball of the brush handle is small enough to not interfere with a variety of bristle lengths and still be easily fit into a mouth with a small aperture. Even a children's design is fully possible.

e. The position of the socket on the brush head is positioned just distally (toward the end farthest from the brush handle) of the mid-position between the medial and distal margins to permit the distal tip of the brush head to guide the rotation of the brush head while still applying relatively balanced forces on the brush bristle area.

f. The arrowhead brush head design is intended to fit the bristles of the narrow distal end of the brush head into small areas in the back of the mouth, yet broad at its medial end to cover a wide surface area of the teeth and gums.

g. The small brush head is designed to improve accessibility to all parts of the mouth-regardless of the size of mouth.

h. The current design has higher bristles on the periphery of the brush head with shorter bristles in the center area. This allows for extension of bristle laterally toward the gingiva (gums) of the target area and distally toward back teeth and interproximal dental spaces (between teeth) while leaving the center bristles to be activated on the tooth surfaces.

i. The small area on the brushing surface that does not have bristles is intended to be used as a toothpaste "well" where toothpaste can be placed without concern of falling off the brush. This storage area stabilizes the toothpaste without having to force paste in between the bristles which can cause "caking" of the paste.

j. The brush is a balanced design where a line extending from the axis of the brush handle meets the ball and socket joint between the handle and the brush head.

k. The bi-angled handle design allows the brush to "bend" around obstructions or gain access to tooth surfaces in the back of the mouth while maintaining the advantages of the balanced design.

l. The rotational head can accept most of the contemporary bristle types and bristle designs.

m. The brush head has a groove that accepts the distal end of the handle to permit a wider range of rotation without obstruction from the brush head.

5 n. The broad handle contributes to brush stability.

o. A long handle can be manipulated by large or small hands.

p. The narrow neck of the brush handle is consistent with size of the brush head, yet is broad  
10 enough to sustain the stresses of abuse.

q. The back (non-bristle) side of the brush head is contoured to contribute to the compact head design and is tapered at all edges to permit smooth movement without any interference to brush movement and  
15 improve the fit of the brush head into tight spaces.

r. The hinge is generally closed; covered by the back of the brush head. This will prevent any pinching or snagging of oral tissues. The contours of the back of the brush head are designed to enhance this  
20 protective characteristic.

s. The three-part design is structured to be the simplest for manufacture with only a single easily articulated binding surface between the brush head and its back.

25 Fig. 8 is a side elevation view of an alternate one-piece embodiment of the improved toothbrush 110 of this invention illustrating the component parts including a bi-angled handle 112 generally defining a primary longitudinal axis 114, a secondary longitudinal axis 114a,  
30 and a tertiary longitudinal axis 114b, and having a first end 116 and a second end 118. Brush head 120 has a top portion 122 and a bottom portion 124, the top portion connected to the bottom portion by a flexible hinge 126 and bearing a handle guide slot (not visible in this  
35 view), and the bottom portion bearing a plurality of downwardly-depending brush bristles 128 generally defining a bristle axis 130. A flexible joint 132 connects the handle first end 116 and brush head bottom portion 124, with the flexible joint 132 enabling brush head rotational

movement about a brush head axis (normal to the plane of the drawing figure and not visible in this view).

5 Fig. 9A is a side elevational view of the alternate one-piece embodiment of the improved toothbrush 110 of this invention as assembled and illustrating the brush head 120 rotated about the brush head axis to maximum inward rotation. This view also illustrates the general alignment of the brush head pivot axis 133 with the primary longitudinal axis 114 of the handle.

10 Fig. 9B is a side elevational view of the alternate one-piece embodiment of the improved toothbrush 110 of this invention as assembled and illustrating the brush head 120 rotated about the brush head axis to maximum outward rotation.

15 Fig. 10 is a top plan view of the alternate one-piece embodiment of the improved toothbrush 110 of this invention in its open configuration and illustrating the relationship of the handle first end 116 to the brush head top portion 122 guide slot 134 before closure.

20 Fig. 11 is a top plan view of the alternate one-piece embodiment of the improved toothbrush 110 of this invention in its closed configuration and illustrating the relationship of the handle first end 116 to the brush head top portion 122 guide slot 134 after closure. This guide  
25 slot 134 permits tangential movement of the brush handle first end 116 about the brush head axis of rotation, but eliminates any other relative movement.

Fig. 12 is a side elevation view of an alternate embodiment of the brush head top and bottom portions 122, 124 wherein they bear a mechanical fastening feature such  
30 as a lip 136 on bottom portion 124 captured by a snap 138 on top portion 122.

Several advantages of the alternate one-piece embodiment of the inventive apparatus over the prior art  
35 include:

- a. A rotational head.
- b. A rotational axis which is perpendicular to the brush handle axis. This maximizes control while allowing the brush head to fit the surface



against which it rests while the operator can still move and adjust the brush head position by rotating the brush or bodily movement of the brush handle.

5           c. While allowing rotation to accommodate brush head position, there are built-in limits to rotation which prevent a brush head position which would be impractical, damaging, or ineffective.

10           d. The triangular brush head design is intended to fit the bristles of the narrow distal end of the brush head into small areas in the back of the mouth, yet broad at its medial end to cover a wide surface area of the teeth and gums.

15           e. The small brush head is designed to improve accessibility to all parts of the mouth-regardless of the size of mouth.

20           f. The current design has higher bristles on the periphery of the brush head with shorter bristles in the center area. This allows for extension of bristle laterally toward the gingiva (gums) of the target area and distally toward back teeth and interproximal dental spaces (between teeth) while leaving the center bristles to be activated on the tooth surfaces.

25           g. The small area on the brushing surface that does not have bristles is intended to be used as a toothpaste "well" where toothpaste can be placed without concern of falling off the brush. This storage area stabilizes the toothpaste without having to force paste in between the bristles which can cause "caking" of the paste.

30           h. The brush is a balanced design where a line extending from the axis of the brush handle meets the flexible joint between the handle and the brush head.

35           i. The bi-angled handle design allows the brush to "bend" around obstructions or gain access to tooth surfaces in the back of the mouth while maintaining the advantages of the balanced design.

          j. The rotational head can accept most of the contemporary bristle types and bristle designs.

          k. The brush head has a groove that

accepts the distal end of the handle to permit a wider range of rotation without obstruction from the brush head.

l. The broad handle contributes to brush stability.

5 m. A long handle can be manipulated by large or small hands.

n. The narrow neck of the brush handle is consistent with size of the brush head, yet is broad enough to sustain the stresses of abuse.

10 o. The back (non-bristle) side of the brush head is contoured to contribute to the compact head design and is tapered at all edges to permit smooth movement without any interference to brush movement and improve the fit of the brush head into tight spaces.

15 p. The hinge is generally closed during use; covered by the back of the brush head. This will prevent any pinching or snagging of oral tissues. The contours of the back of the brush head are designed to enhance this protective characteristic.

20 While this invention has been described in connection with preferred embodiments thereof, it is obvious that modifications and changes therein may be made by those skilled in the art to which it pertains without  
25 departing from the spirit and scope of the invention. Accordingly, the scope of this invention is to be limited only by the appended claims.

CLAIMS

What is claimed as invention is:

1. A toothbrush comprising:
  - 5 a bi-angled handle member generally defining a primary longitudinal axis, secondary longitudinal axis, and tertiary longitudinal axis; and
  - a brush head member connected to and pivotable about said handle member on a brush head axis of rotation, and carrying a plurality of downwardly-depending
  - 10 brush bristles defining a bristle axis, such that said brush head axis of rotation is generally perpendicular to both said handle member primary longitudinal axis and said bristle axis.
- 15 2. The toothbrush of claim 1 wherein said handle member terminates in a first end which includes a pivot element enabling brush head rotational movement only about said brush head axis of rotation.
3. The toothbrush of claim 2 wherein said brush
- 20 head axis of rotation intersects said handle member primary longitudinal axis.
4. The toothbrush of claim 1 wherein said brush head member comprises a top portion and a bottom portion.
5. The toothbrush of claim 4 wherein said brush
- 25 head top portion and bottom portion each include a pivot element contact surface.
6. The toothbrush of claim 5 wherein said brush head member bottom portion includes a reinforcement feature adjacent said pivot element contact surface to
- 30 accommodate placement of brush bristles.
7. The toothbrush of claim 4 wherein said brush head top portion and bottom portion each include a handle member guide slot to enable relative motion of said brush head only about said brush head axis of rotation.
- 35 8. The toothbrush of claim 1 including a spring element connected to said handle member to bias said brush head member to a normal position.
9. The toothbrush of claim 1 wherein said brush head member has a medial end and a distal end, and wherein

said brush head axis of rotation is positioned distally of the mid-position between said medial and distal ends.

10. A toothbrush comprising:

5 a bi-angled handle member generally defining a primary longitudinal axis; and  
a brush head member connected to said handle member by a flexible joint and pivotable about said handle member on a brush head axis of rotation, said brush head member carrying a plurality of downwardly-depending  
10 brush bristles defining a bristle axis, such that said brush head axis of rotation is generally perpendicular to both said handle member primary longitudinal axis and said bristle axis.

11. The toothbrush of claim 10 wherein said  
15 handle member terminates in a first end which includes a flexible joint enabling brush head rotational movement only about said brush head axis of rotation.

12. The toothbrush of claim 10 wherein said  
20 brush head member comprises a top portion and a bottom portion connected together by a flexible hinge.

13. The toothbrush of claim 12 wherein said  
brush head top portion includes a handle member guide slot to enable relative motion of said brush head only about said brush head axis of rotation.

25 14. A toothbrush comprising:  
a bi-angled handle member having a primary, secondary, and tertiary longitudinal axis; and having a first end and a second end; and

a brush head member connected to said  
30 handle member by a flexible joint, and pivotable in only one plane of rotation about said handle member first end on a brush head axis of rotation, and carrying a plurality of downwardly-depending brush bristles defining a bristle axis, such that said brush head axis of rotation  
35 intersects said handle member primary longitudinal axis and is generally perpendicular to both said handle member primary longitudinal axis and said bristle axis.

15. The toothbrush of claim 14 wherein said  
brush head member comprises a top portion and a bottom

portion connected together by a flexible hinge.

16. The toothbrush of claim 14 wherein said  
brush head top portion includes a handle member guide slot  
to enable relative motion of said brush head only about  
5 said brush head axis of rotation.

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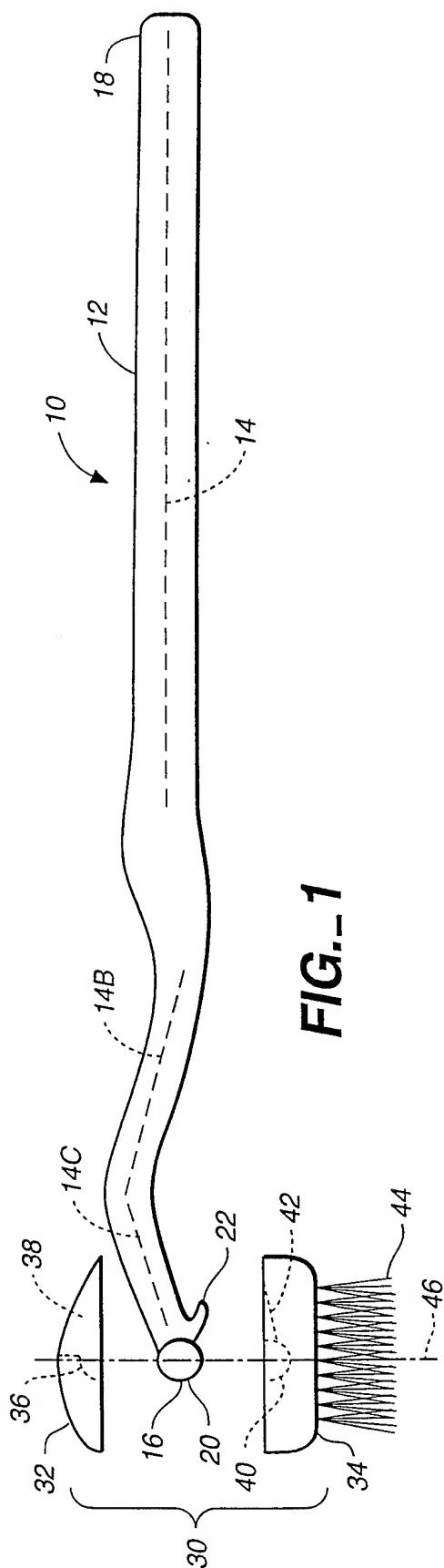


FIG. 1

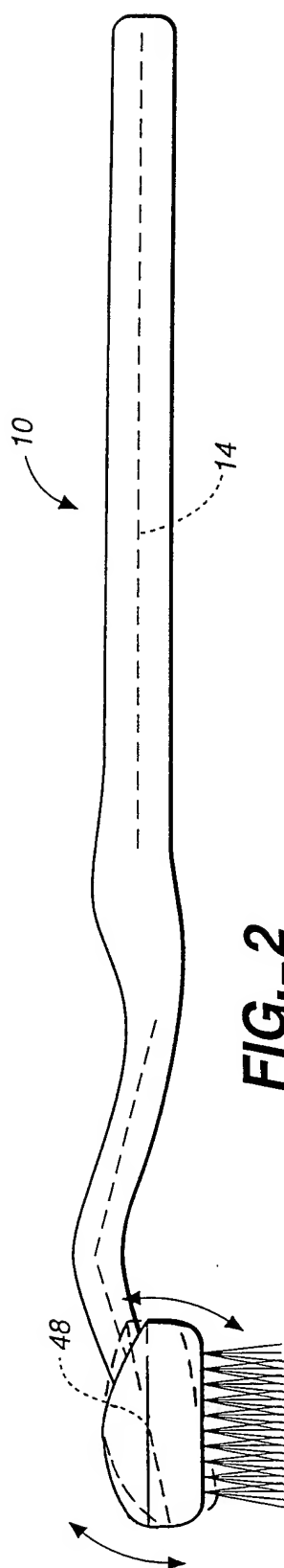


FIG. 2

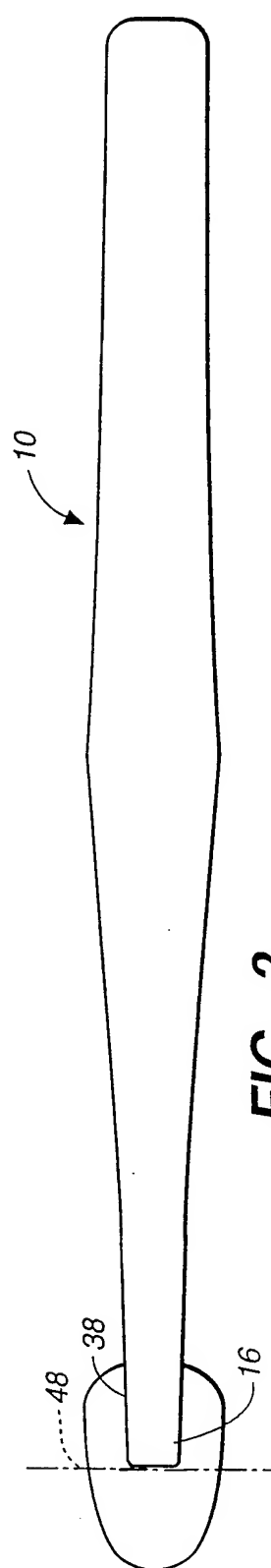
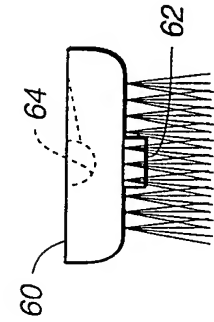
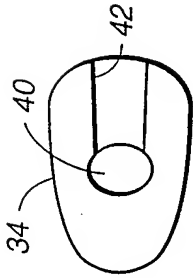


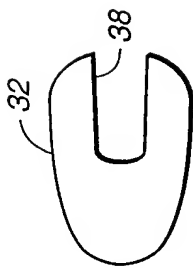
FIG. 3



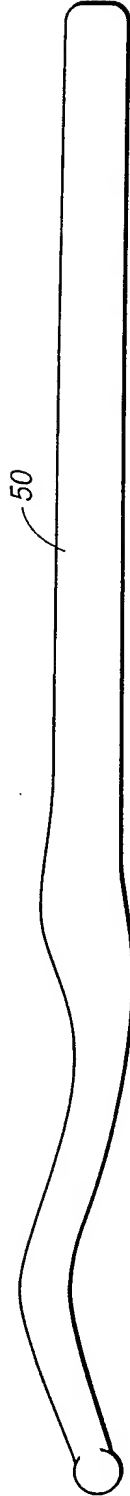
**FIG. 7**



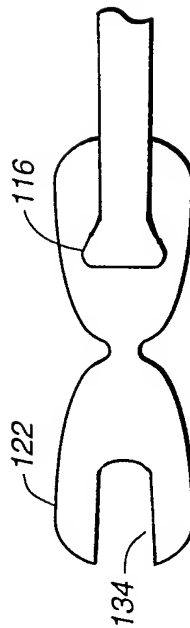
**FIG. 5**



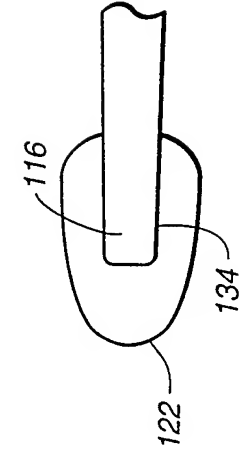
**FIG. 4**



**FIG. 6**

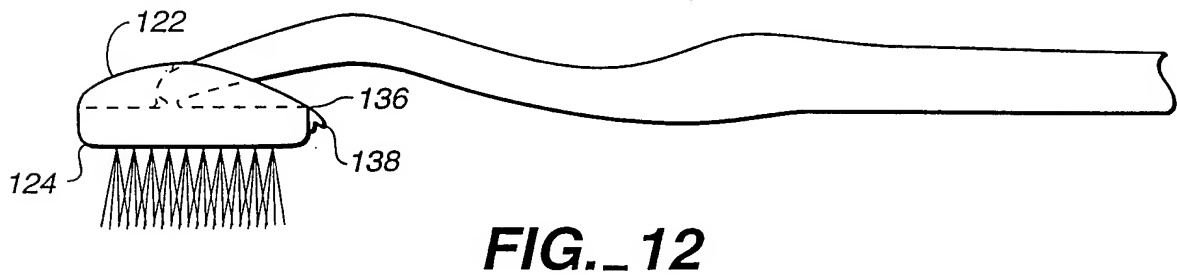
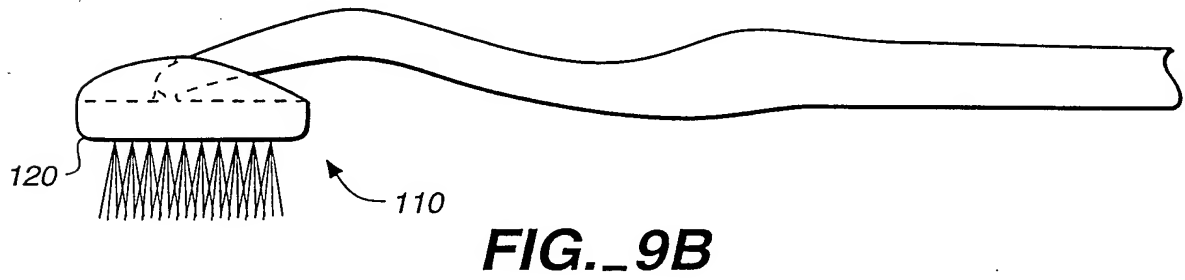
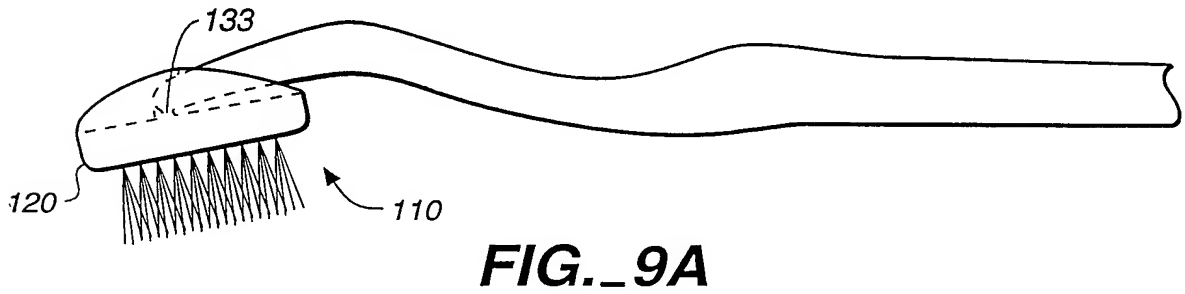
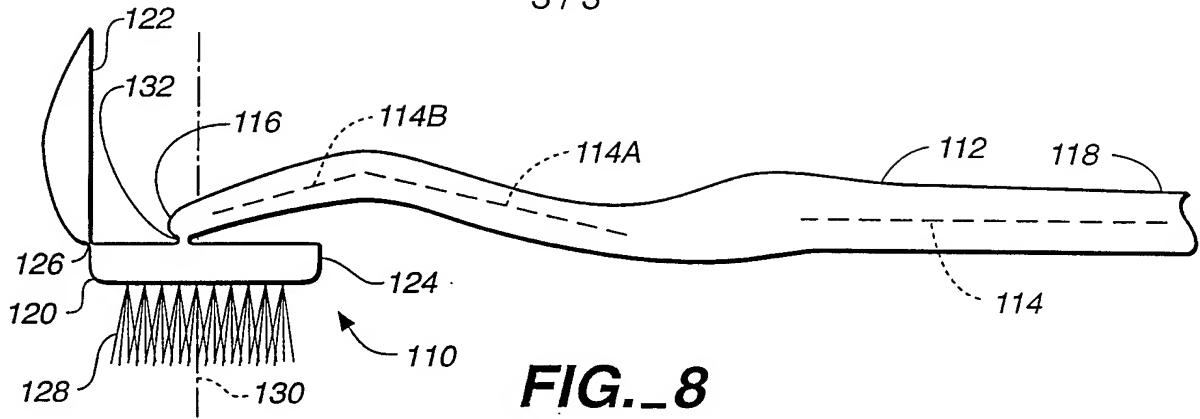


**FIG. 10**



**FIG. 11**

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## INTERNATIONAL SEARCH REPORT

Intern al Application No

PCT/US 94/12696

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A46B7/06 A46B7/02 A46B5/02

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A46B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| X          | US,A,5 228 166 (GOMEZ) 20 July 1993<br>see the whole document<br>---               | 1-3,8-16              |
| X          | FR,A,2 277 547 (MOULET) 6 February 1976<br>see the whole document<br>---           | 1,2,8-16              |
| A          | US,A,4 488 328 (HYMAN) 18 December 1984<br>see the whole document<br>---           | 1-3,8-16              |
| A          | US,A,4 667 360 (MARTHALER ET AL.) 26 May 1987<br>see the whole document<br>---     | 1                     |
| A          | US,A,4 780 924 (HANSEN ET AL.) 1 November 1988<br>see the whole document<br>-----  | 1                     |

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Date of the actual completion of the international search

6 March 1995

Date of mailing of the international search report

17.03.95

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Information on patent family members

International Application No

PCT/US 94/12696

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|---|---------------------|----------------------------|---------------------|
| US-A-5228166                              | 20-07-93            | NONE                       |                     |
| FR-A-2277547                              | 06-02-76            | NONE                       |                     |
| US-A-4488328                              | 18-12-84            | NONE                       |                     |
| US-A-4667360                              | 26-05-87            | NONE                       |                     |
| US-A-4780924                              | 01-11-88            | US-A- 4850735              | 25-07-89            |